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AUTHOR Southworth, John H.
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ABSTRACT

Telecommunications projects underway in Hawaii include various multimedia computer-based educational telecommunications (CBET) and multimode node telecommunications (MMN) projects. CBET uses a computer network to send messages rather than an ordinary telephone call, and MMN is a technique for transferring messages, data, and images between electronically incompatible systems. Both systems are used in an asynchronous manner, whereby sender and receiver need not exchange information at the same time, and in a synchronous manner which is both immediate and interactive. A CBET project in Hawaii is the Hawaii Global TELEclass project, which has involved Hawaiian students in foreign language exchanges with students from Japan, as well as in other foreign language exchanges in Hawaii. As TELEclass continues into its third year, exchanges involving other languages and other subject fields are under consideration. The TELEclass experience also provides information about the establishment of a telecommunications program that can be transferred to other similar programs. (EW)

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The Hawaii Global TELEclass Project

and Multimedia Computer-Based Educational Telecommunication (CBET)

John H. Southworth

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This paper presents a brief introduction to telecommunications, gives examples of projects already underway, and provides interested educators with information on how they can enrich their own classroom activities through telecommunications.

In the 1970s and 1980s, the field of electronics and telecommunications literally went into outer space. Today, increasing numbers of schools have their own satellite dishes, picking up audio, video, and computer signals from around the world. Unfortunately, while a school can receive such information quite economically, transmitting information is still quite expensive.

For many years there has existed a cheaper mode of receive-transmit telecommunications: the telephone. Telephone-based audio, video, and computer information exchange is much more affordable for educational institutions with limited budgets.

Multimedia Computer-Based Educational Telecommunication

Multimedia Computer-Based Educational Telecommunication (CBET) recognizes the central role of the computer to provide a convenient base for organizing and carrying out various educational telecommunications modes. Generally, CBET involves the use of a computer network rather than sending messages directly to another computer through an ordinary phone call. In this way, messages can be stored in a computer that is shared by many others and is linked to a data network. Such a system permits phone calls that are less expensive than direct-dialed calls to the microcomputer of the person with whom one is communicating. The multimedia and synchronous element of CBET can include a variety of audio, video, or data exchange systems over which a specific educational telecommunications event may take place. Coordination is normally done asynchronously, via computer mail or bulletin boards.

Multimode Node Permits Greater Connectivity

Multimode Node (MMN) telecommunication is a technique for transferring messages, data, or images between electronically incompatible systems. For instance, two computer networks not directly linked can exchange information by MMN techniques of "downloading" from one computer to another and "uploading" that information to another system. MMN linking of audio and computer systems is also possible; spoken information is transcribed into a computer network for subsequent dissemination to persons not able to listen to the original speaker. The reverse process involves reading computer messages into an audio teleconference, or using a facsimile machine or camera to transfer the information visually.

What Are the Basic Types of Computer Communication?

Messages can be exchanged on computers using electronic mail programs, or e-mail (longer messages are often written using a word processing system). Then, after the microcomputer is linked to the central computer network's mail system, the message is uploaded from the file created by the person originating the message. In the reverse procedure, information is downloaded to a disk and can later be edited or printed "off-line" (after the communications link is ended), using the same word processing program. Each subscriber on a computer system has an ID or "username," a nickname that is used when receiving and sending messages.

Sending messages to a group with larger or indefinite numbers of participants is done more conveniently using an electronic bulletin board system (BBS) or computer conferencing system. These systems utilize files that are either open and public to all users on a system, or restricted and private for a predesignated subgroup of users.

Most computer communication systems offer both electronic mail and bulletin board conferencing systems.

Understanding Synchronous and Asynchronous Communication

Synchronous communication occurs when we talk face to face. An ordinary telephone call involves synchronous telecommunication, which is both immediate and interactive. When we send a letter or use computer mail, we're using **asynchronous** telecommunication. The sender and receiver do not need to exchange information at the same time. Asynchronous telecommunication, especially between parties several time zones apart, is generally more convenient. We can send a message or get our computer mail at *our* convenience and know that those sending messages to us and receiving our messages have been able to operate at times convenient to them. You don't "miss that phone call" when using asynchronous communication because the message is recorded by one means or another for later retrieval.

Examples of Multimedia CBET

Examples of Asynchronous CBET

- Project MENTOR (Marine Educators Network to Organize Resources) was an experiment set up in 1981 to provide teachers and students of marine science in various locations an opportunity to exchange information and ask questions via computer mail. Two computer systems were used: the Electronic Information Exchange System (EIES) of the New Jersey Institute of Technology and the University of Illinois PLATO system.

- Project MENTOR included a water-quality data gathering experience based on laboratory procedures for water testing developed as part of the High School Marine Science Studies Program. This program was initiated by the University of Hawaii College of Education Curriculum Research and Development Group. Water temperature, salinity, oxygen content, clarity, and other factors were tested at local sites and posted on computers for comparison by other sites. (The synchronous element of Project MENTOR is noted in the following section.)

  EIES Public Conference 1073, "Science, Math, Technology Information Exchange Network," was used to ask for information about fish, coral, or other marine topics. In EIES computer conferences, items are entered sequentially; each has a CC (Computer Conference) number and an optional Associated Message reference and Key Word title.

- The PLATO conferences ("groupnotes") follow a similar format, except that PLATO permits a parallel message structure. A menu index indicates the original item with the number of comments attached to it. One can immediately read and/or respond to a particular item rather than read through a sequential list of items.

- A poignant example of computer communication on the EIES system involved linking people at a retirement home and youths in a home for persons with cerebral palsy. Using special devices, the young people slowly entered their messages into the computer. Asynchronous communication allowed the completed messages to be printed out with no indication of any physical handicap, allowing them to be judged solely on their content.

EIES developer Murray Turoff told of the shock of visiting face to face with some of his new acquaintances at that home. Not only did he experience the emotional impact of seeing the disabled children, but he was also dismayed that he could no longer communicate interactively with those who could not speak or could write only with great difficulty. Indeed, the computer was the tool that freed these people from their difficulties and permitted greater communication than was possible in a face-to-face situation.

An Example of Synchronous CBET

As part of Project MENTOR, audio teleconferencing took place over PEACESAT, the Pan-Pacific Education and Communication Experiments by Satellite. From the early 1970s, PEACESAT has provided free international audio communication for sites in the Pacific Basin that developed the low-cost PEACESAT ground stations.

Included in the PEACESAT Project MENTOR session were students in Honolulu (Hawaii), Pago Pago (American Samoa), and Wellington (New Zealand). The data gathering took place in June. Figures from New Zealand showed much lower temperature values, an interesting and immediate illustration of the fact that it was winter in the Southern Hemisphere. The Hawaiian and Samoan students, upon comparing dates, discovered they were talking "to tomorrow" with the New Zealand students, who were on the western side of the International Date Line. These dramatic and immediate examples provided concrete illustrations of geography in terms of longitude, latitude, hemispheres, seasons, and time zones.

Data from Florida, which was not within the range of the PEACESAT system, was transmitted via EIES and was shown on overhead transparencies in Honolulu. It was dictated to the Samoan and New Zealand students for completion of their water-quality charts. A high salinity figure for the Pago Pago harbor led to a discussion of the possible reasons for the result. It turned out that the data had been collected next to the fish cannery, which uses a lot of salt in its processing. Runoff went straight into the harbor. This and other concrete examples promoted environmental awareness. The Samoan teacher participating in this project repeated the activity with students in subsequent years, and similar salinity values were found. The data resulted in the denial of a permit to expand the cannery, based on the environmental impact demonstrated by the students' figures.

The Hawaii Global TELEclass Project: A Model of Multimedia CBET

In September 1985, the first international teleconference of the Telecommunication Enriches Language Experiences (TELEclass) Project took place. Students of Hawaii's Castle High School Japanese class interacted with English language students of Tokyo's Gakushuin School.

In the past two years, about 100 TELEclass sessions have been held, involving secondary school students in Hawaii and their counterparts overseas in Japan, Korea, Taiwan, Hong Kong, People's Republic of China, Canada, Puerto Rico, Tahiti, Spain, France, and Germany. In that time, much was learned, not only about the technical aspects of "linking" students on a global scale, but about factors relating to cross-cultural differences and contrasting school systems.

A typical TELEclass session begins with an exchange of greetings from each side, a set of questions and answers, an open forum for additional questions, and closing comments and thanks. The session is bilingual—a Hawaiian student asks a question in the target language and it is answered in the target language by a student overseas. That student then asks a question in English and the Hawaiian student answers it in English. To help students get used to the technology, beginning scripts have been prepared, so each student can read the question in the target language and is prepared with an answer in his or her native language.

Besides the use of slow-scan TV, video enhancement is provided through the use of duplicated color slides or videotapes. Typically, students develop a set of 20 to 30 slides of their school, the community, and student activities. These are duplicated and a copy is sent overseas. The presenting school retains a set to show simultaneously. Through ordinary audio TELEclass techniques, the students narrate the slides in the target language and questions are asked by the viewing students. It is important that slides be shown simultaneously at both sites for reference as questions are asked. Slides are both inexpensive and easy to use in terms of editing and pacing. When questions are asked, a longer time can be spent on individual slides as necessary.

TELEclass began as a multilevel program to enhance the learning of foreign languages. It was organized in the following stages:

Level 1: Introductory matching of schools with common areas of subject matter. Introductory exchange of materials between schools. Planning for equipment acquisition and for subsequent levels.

Level 2: Telephone conversations. Students use speakerphones that permit groups of students at each end to listen. For TELEclass language experiences, an introductory script (in English and Japanese, for example) provides a helpful guide for students in both locations. Visual enhancement is possible at this level through the exchange of duplicate sets of color slides that show the school, its students, the town, and the local area. These are shown at both locations during the session, with dialogue and subsequent questions exchanged over the speakerphone.

Level 3: Electronic mail. Through electronic mail on central computer systems linked by long distance communication, it is possible for students to write electronic "pen pal" letters back and forth. The computer mail and conferencing (TWICS Parti TELEclass/Japan file) permits convenient planning for the telephone and other live TELEclass activities. (NOTE: As computer communication becomes more and more accessible to schools, it is expected that this level will become Level 1 and will be the launching point for TELEclass participation by interested schools.)

Level 4: Videophone. While full-motion, interactive television conferencing is quite expensive (especially on an international scale), the use of slow-scan or freeze-frame television is possible over an ordinary telephone line. SSTV activities using Colorado Video or Lumaphone equipment have been popular modes of TELEclass exchanges.

Level 5: Student and/or teacher exchange. Students who have become acquainted through TELEclass telecommunication projects are able to meet face to face, participate in direct learning experiences, and see each others' culture firsthand.

CBET Basis of TELEclass

TELEclass is based on multimedia Computer-Based Educational Telecommunication (CBET), which involves the use of central computer communication to coordinate the project. In Hawaii, all schools have been linked through the University of Hawaii DEC20 computer mail and electronic bulletin board systems. These systems have been the basis of communication between TELEclass schools and project staff. The project has been facilitated by a partnership with Career Kokua, the Computerized Information Delivery System (CIDS) that has placed computer terminals and phone lines in each of the high schools in Hawaii, providing easy access both to the computer network and to inexpensive Radio Shack Duofone 101 or 102 Speakerphones for audio TELEclass sessions. Thanks to the cooperation of Colorado Video Corporation and Luma Telecom, Inc., video enhancement has been possible through slow-scan television and equipment loaned to the project.

Expanding Partnerships

Through the use of international computer networks, TELEclass coordination has been facilitated between Hawaii and overseas sites. EIES has been the main system used for such communication. During a trip to Japan, Korea, and Hong Kong in December 1985, it was possible not only to coordinate the TELEclass sessions between those countries and Hawaii but also to document the events in one of the computer conferences on EIES. This technique has permitted dissemination of TELEclass activities, with a view toward the time when the scope of participation can be broadened.

An MCI Mail/Telex connection has been invaluable, especially with TELEclass contacts with Shanghai Teachers' University, which has been the local coordinating agency in Shanghai. While telephone contact there has been difficult and of marginal quality, the MCI Mail link has been both convenient and reliable in coordinating TELEclass exchanges.

Recently, Simon Fraser University (British Columbia) and TWICS Beeline (Tokyo) computers have been added to the network. It is hoped that development of the Global Students Network system will provide further support for TELEclass CBET activities.

The National Association of Laboratory Schools (NALS) has a network on the University of Michigan Confer 2 system, and is planning to explore expansion of TELEclass to other parts of the U.S. Further U.S. development is expected through a Phi Delta Kappa District 2 grant to explore TELEclass interstate activities in schools sponsored by local PDK chapters.

A special example of the international possibilities of CBET has been the experience of TELEclass at the last two Second Language Institutes at Kalani Honua Conference Center in Hawaii. At the Institute, up to 100 persons gather annually to immerse themselves in a foreign language for a week, residing in the Japanese, French, Spanish, or Hawaiian house. Each year TELEclass sessions have been included, both to extend contact and to provide for various computer, audio, and video telecommunications experiences for the institute participants.

In 1986, the French House decided to hold a bridged teleconference with French-speaking people in France, Louisiana, and Quebec to allow the participants to hear different French accents in real time. In addition to contributions from members of the French House, representatives of each of the other languages studied at the Institute gave short greetings. It was a moving and historic moment to observe Jean Keale, principal of the Ni'ihau Elementary School, give a prayer in Hawaiian. (It was subsequently translated into French.) She spoke regally, totally absorbed in her task and moved by the opportunity to share her Hawaiian language and culture with other parts of the world. She noted that she also hoped the day would come when students on the isolated and privately owned island of Ni'ihau—where they don't even have telephone service—could benefit from such experiences.

Future Alternatives

As TELEclass continues into its third year, there is great interest not only in utilizing many of its current elements but in moving ahead in new technological and curricular areas.

Now that the basic techniques have been tested and confirmed, it is hoped that greater attention can be placed on alternative curricular approaches to audio, visual, and computer TELEclass activities. Greater emphasis is planned on teacher and student training in the use of the computer network and speakerphone equipment. Various "school partnership" agreements are being considered to provide for both funding and coordination assistance, and should permit more schools to participate.

One such example is the previously mentioned grant from Phi Delta Kappa's District 2. The intent of this grant is to test the applicability of TELEclass techniques among U.S. schools. If successful, other PDK District grants are expected that could lead to a national TELEclass network.

Another type of partnership has been exploring the introduction of TELEclass to Russian language and cross-cultural experiences. The Initiative for Understanding program sent a group of Hawaiian students to the Soviet Union during the summer of 1987. The Hawaii Initiative program coordinators are working closely with TELEclass to investigate the possibility of utilizing such telecommunication links with students in the U.S.S.R. In July 1987, a Moscow–Honolulu demonstration of TELEclass audio communication took place; this was the first linking of these Hawaiian students with people in the Soviet Union.

The Hawaii Department of Education is studying the possibility of extending TELEclass techniques from its start in the area of foreign language instruction to social studies, art, music, and science. That direction could involve NALS schools around the country, encouraging them to interact among themselves as well as with schools overseas. When this is achieved, TELEclass will enrich learning as well as languages.

Discussion is underway of methods for developing a TELEclass subscription that could include various elements of (1) computer access/equipment, (2) audio/video equipment, and (3) telecommunications costs.

Establishing an Educational Telecommunications Program

As many educational administrators already know, establishing a new telecommunications program involves several diverse technological and financial issues. Some of these are discussed here.

Despite the fact that narrow-band telephone technologies currently represent the most economical forms of telecommunication, you should first survey locally available resources.

- Is there an existing audio/video/computer resource that will provide an upscale entry into the field of telecommunications?

The PEACESAT network in Hawaii, using the ATS-1 (and later ATS-3) satellites, is just such an example. The previously described Project MENTOR water-quality data exchange took place internationally at no cost using PEACESAT. Ironically, at that time it was easier (and less expensive) to hold international teleconference activities for Oahu students with students around the Pacific Basin than it was to do so with students on the neighboring islands of Hawaii. The latter required long distance phone calls! Interisland activities have been possible only since TELEclass began.

- How good is telephone access?

While new forms of multiuse (audio, video, and computer data) cabling are being developed, the present key to low-cost telecommunication is the ordinary phone line. Ideally, each classroom would have a phone jack to which the modem or speakerphone could be attached. This approach should be the plan for any schools being built or renovated, to allow best flexibility to participate in CBET.

For the present, the most pragmatic approach would be to identify an existing line to which a phone jack can be added or, even better, to install a new line that has one or more outlet jacks for the use of telecommunications. (Note: An ordinary line can be used for standard telephone conversations when not being used for telecommunications.)

It is important to determine whether the phone system is the electronic or regular type. Most existing speakerphones and other kinds of telecommunications equipment that are primarily designed for ordinary two-wire communication do not work on the new electronic phone lines without special adaptors. Ideally, simple interfaces between regular lines and electronic lines, or switchable telecom equipment operating on either type, will be developed. For the time being, let the user beware.

• What if I do have an electronic phone system?

The best plan is to arrange for a "bypass" of one of the lines for use directly with telecommunications systems. Be sure that modular jack capability is provided so that speakerphone, SSTV, facsimile, or computer equipment can be easily plugged in and out.

• Where should the phone jacks be located?

If having multiple-access jacks in all classrooms is not possible, then the logical locations would be multiple-use facilities such as the audiovisual center, library, or computer lab.

• What if I need a speakerphone?

The speakerphone is one of the easiest to use and most important devices for developing good synchronous telecommunications techniques. Speakerphones range from simple ones like the Radio Shack Tandy 101 or 102, costing less than $50, to more elaborate systems with various options that cost hundreds of dollars (Darome or Westell conferencing systems, for example). Some new phones come equipped with speakerphones. (Note: If the loudspeaker volume is limited, the use of an external microphone and speakers is helpful in a large room or in noisy conditions.)

• What are some considerations in using video telecommunications?

The use of video in multimedia CBET can take several forms. For example, printed and photographic information can be duplicated and sent by mail ahead of time. Schools often make up packets of information (written and visual) about their school, students, and community. These can be the bases for discussion at subsequent synchronous audio events or during ongoing asynchronous computer communications.

Videotapes are dynamic and excellent resources to show either before or after an audio session. However, different international video standards (such as PAL and NTSC) may require converting tapes for use on local equipment, causing considerable frustration and incurring high costs. Additionally, it is difficult to ask questions about a specific frame or subject in a video or film. Editing of videotapes is time-consuming and difficult if adequate equipment is not available.

The use of 35mm slides provides an extremely convenient method of introducing the visual aspect of a subject. During Project MENTOR, slides showing students at one school constructing papier-mâché models of islands were made, duplicated, and distributed to the other sites. The students who made the models commented on the step-by-step process as each slide was locally projected.

In 1982, NASA provided teachers an opportunity to borrow moon rocks that had been collected during the Apollo Mission. First, however, each participating teacher had to be trained through a NASA Moon Rocks Handling Training Session. Normally, these sessions are given at regional NASA educational centers. The center closest to Hawaii was in California, and thus required a financial and time commitment. NASA was contacted and agreed to conduct a remote moon rocks certification training program for teachers in Hawaii via multimedia teleconference.

Appropriate printed materials, slides, and videotapes were mailed ahead of time. Slow-scan television (SSTV) and a speakerphone were the synchronous elements. SSTV equipment provided by Colorado Video, Inc. linked the 40 Hawaii participants with the NASA education center in Washington. After a welcome from NASA and an exchange of pictures, the Hawaii group looked at the videotape and slides. During the question-and-answer session that took place via SSTV, the NASA official showed an actual sample of moon rock. The teachers who were certified became eligible to borrow moon rock samples for use in their classrooms. Several thousand dollars were saved, not to mention the personal time of the participating teachers and the training staff, who did not have to leave their own laboratory.

Increasing opportunities for full-motion, satellite, or microwave multimedia CBET are developing. The low cost of "receive-only" dishes makes picking up signals an increasingly popular option in teleconferencing. Normally, because having an uplink is so expensive, these involve one-way broadcast TV and two-way phone audio links.

NASA and Creighton University coordinated multimedia CBET links during the 51D NASA Mission. Full-motion TV and computer networking were the prime modes of the teleconferencing. Local schools in Hawaii were linked with the University of Hawaii computer, to which conference items were transferred via a computer on the mainland. Local school groups came to the University of Hawaii to watch live sessions as well as those recorded and transmitted via satellite. Delays in tuning the satellite ground station in Hawaii necessitated linking via SSTV during the opening teleconference. Ellison Onizuka, Hawaii's first astronaut, was in Hawaii during the 51D Mission. His remarks and image were beamed by SSTV to a school in Wisconsin, where Colorado Video SSTV equipment was installed. The first high school in Hawaii to have a satellite dish obtained it as a result of their participation in the 51D Mission Watch teleconference and their subsequent enthusiasm.

- How can I introduce video techniques at low cost?

The amount you spend for video will depend on your budget and on available resources. The basic low-cost approach is to use printed pictures or color slides. For example, a set of 20 to 30 slides is adequate for a 30- to 60-minute program. These can be easily duplicated, numbered, and sent ahead of time. Students from the originating site then prepare the dialogue for the slides. Easy editing (you just pick and choose), low cost, and the ease of stopping for questions and answers are advantages of using photo or slide video programs.

Videotapes, as mentioned before, can add a dramatic element but are best used outside an actual teleconference. Some schools have limited editing facilities and, in dealing with international video exchanges, there may be problems in converting between PAL and NTSC standards. (Note: The investment in a VCR with PAL/NTSC capability might be worthwhile, saving conversion costs, frustrating delays, and inability to view tapes made overseas.)

- What kinds of on-line video can be used?

On-line video ranges from full-motion to freeze-frame SSTV. The latter ensures low cost and allows for use of the equipment from almost any location that has a telephone and modular jack arrangement. Examples of companies manufacturing SSTV equipment are the Mitsubishi-owned Luma Telecom of California; Colorado Video, Inc. (CVI); and Photophone of Texas. At the time of this publication, the basic Luma system is less expensive, lighter, and easier to use than the others but has limited teleconferencing capabilities. CVI and Photophone produce more expensive equipment, but allow greater latitude of telecommunications and teletraining possibilities.

Luma is working on a project to use the Lumaphone with police data banks to quickly distribute photos of missing children. Colorado Video maintains a network of CVI SSTV equipment users called Scan Net that encourages self-initiated, cooperative video teleconferencing around the country and to a few international sites. Photophone has been using its equipment to link remote Eskimo villages in Alaska with central health facilities in more urban areas to provide for emergency and routine health care.

Facsimile ("fax") is a capability with growing potential. It basically involves copy machines linked through telephone lines. Just about anything that can go through a copy machine can be sent via fax. Although fax has been around for years, it is only recently that the price has dropped below $2,000 for a basic system, making fax practical for schools to use. As businesses begin to make this a standard item of equipment, schools might establish a partnership with a local company to utilize its fax machines until they can obtain their own. In Hawaii, each Department of Education District Office has fax capability, but few local schools have the equipment. An early TELEclass event between schools in Honolulu and Tokyo was made possible by transmitting the script through a Japanese golf store that had fax capability in both its Honolulu and Tokyo outlets. It appears that the growing use of computer graphics, facsimile, and other video systems holds great potential for multimedia CBET projects.

- Does the state or university provide a full-motion ITFS (such as HITS, Hawaii Interactive Television System) that is subsidized to permit free or low-cost telecommunications?

The use of full-motion television will undoubtedly continue to grow, as will opportunities to participate in distance learning and teleconferencing. This will generally become economical when large audiences can share the high costs of renting satellite systems. On a more local (and lower-cost) scale are microwave systems such as ITFS (Instructional Television Fixed Service). In the fall of 1987, the Hawaii Interactive Television System (HITS) will begin statewide full-motion programming of courses and teleconferencing on a one-way video, two-way audio basis. HITS will be able to involve interstate or international programming by interfacing SSTV or satellite TV systems for special programming.

Development of educational consortia is expanding to allow shared use of satellite TV channels by groups for course delivery and teleconferencing. This approach will grow, but potential subscribers need to compare their distance learning or teleconferencing needs with the types of service provided by the various consortia and commercial systems.

- What about computer network subscriptions?

There are several dozen commercial, private, educational, nonprofit, and individual computer networks. They range in scope from very small systems (a single microcomputer with a modem and phone line that serves one user at a time) to large international systems (a mainframe computer attached to a communications network, with ports allowing dozens of users to be on-line simultaneously).

Individual schools and computer stores often start with a small system. The advantage is that a small system is usually free or very inexpensive. The main drawbacks are that such a system is limited primarily to local users and does not support simultaneous, multiple use.

For global (or at least interstate) computer telecommunication, it is best to use a system that is linked to a network with many local nodes, in which a local phone number can be called to access the network. In such a case, you usually pay for the network charges ($3–20/hour for various systems in the U.S.) as part of the charges billed by the computer electronic mail or bulletin board system used. Examples of data networks are Telenet, Tymnet, and USnet. Host systems such as EIES, CompuServe, The Source, Unison, MIX, NWI, Confer 2, and TWICS Beeline maintain links with one or more data networks. The subscriber then gets an invoice for monthly data network charges plus charges for use of the computer. Rates range broadly and involve a variety of charging methods. Most provide both electronic mail (e-mail) and electronic bulletin board systems.

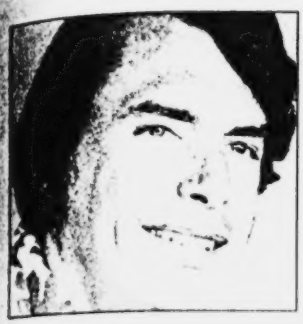
The choice of a network depends on (1) whether there is an ongoing or special event of personal interest taking place on the system, (2) whether you want to link up with a certain party already on the network, and/or (3) whether the cost to use the computer fits into your budget.

If you plan to use computer networking, then a terminal or microcomputer with a modem is required, as is a communications software package to interface the microcomputer with the computer network. Help in these matters is best obtained from an acquaintance already participating in a network or from a communications subcommittee of a local computer users' group.

Conclusion

This paper has been written to stimulate thinking and planning among local educational distance learning and teleconferencing planners and teachers. The pragmatic approach to using available resources permits educators to take different paths to enter the field of telecommunications. These examples of educational telecommunications should help point the way to a new age in education. The multimedia CBET concept of starting with computer networking will greatly help in planning, executing, and keeping up to date with current resource developments and systems.

Multimedia CBET is easily adaptable to any curricular area. It is the motivation, imagination, and creativity of the teacher that will determine who and what can be featured via telecommunications to enrich the educational environment. The natural intelligence of the teacher, rather than the artificial intelligence of hardware or software, will determine the quality of telecommunications and the extent to which it will become part of the world of learning. Don't wait, or you'll miss your chance to be a pioneer in global education!



John Southworth

John Southworth is an educational associate with the Curriculum Research and Development Group (CRDG) of the University of Hawaii College of Education. Since September 1985, he has been senior investigator for the Hawaii Global TELEclass (Telecommunication Enriches Language/Learning Experiences) Project in Hawaii.

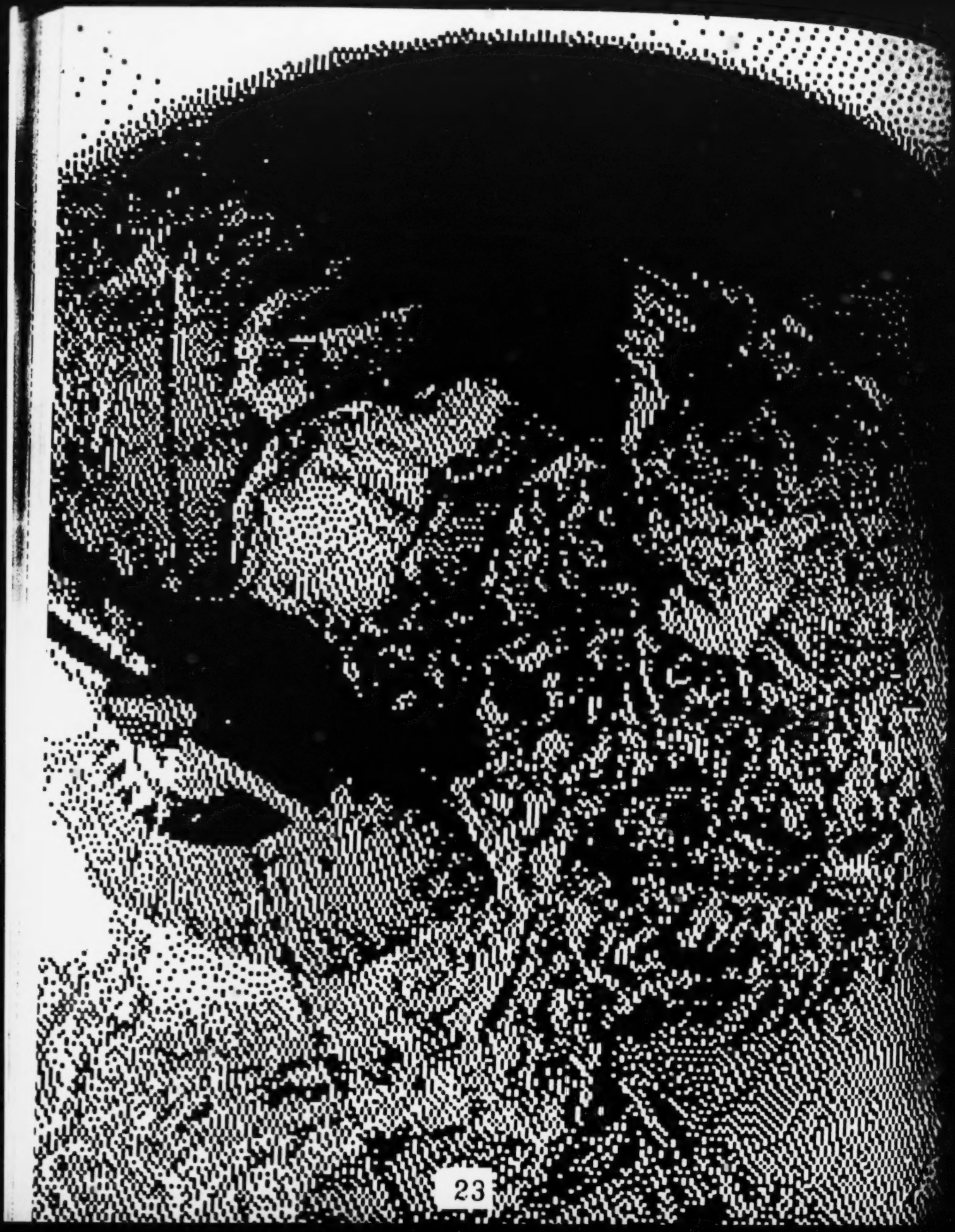
Mr. Southworth was recognized by Scholastic, Inc. Electronic Learning as one of the Electronics-Using Educators of the Year in 1984 "for significant contribution to the advancement of education through technology."

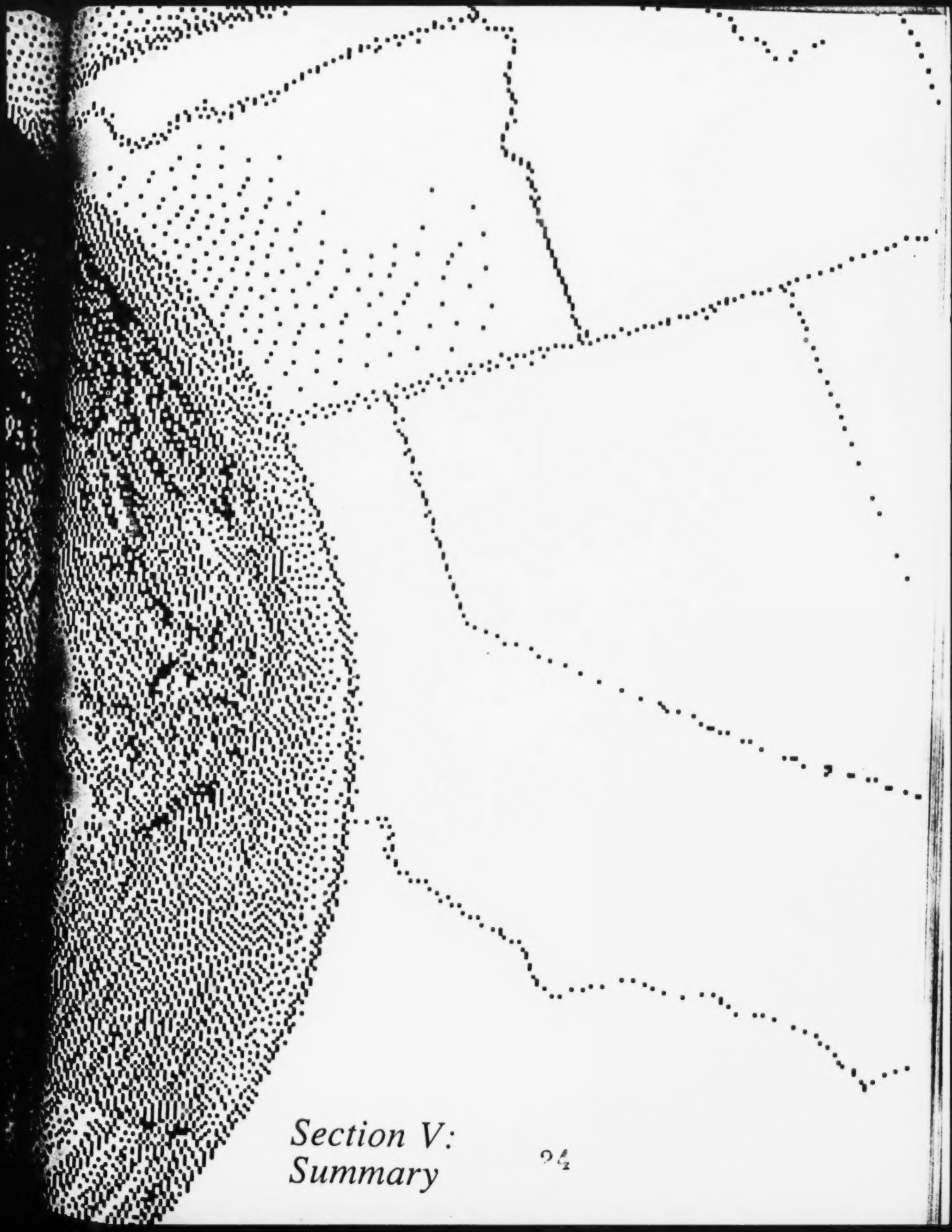
He holds a B.A. in chemistry from Pomona College and an M.Sc. in oceanography from the University of Hawaii. He taught science and math with the Peace Corps in Malaysia. In recent years he has taught chemistry and technology courses at the University of Hawaii and the University Laboratory School. He pioneered the field of

multimedia Computer-Based Educational Telecommunication (CBET) and Multimode Node (MMN) transfer of information between electronically incompatible systems.

In 1979, he was invited to become a member of the Electronic Information Exchange System (EIES). He continues today as moderator of ongoing EIES computer conferences on religion and technology, computers in education, and science/math/ technology. He also uses regularly NSI, Simon Fraser (Vancouver), TWICS Beeline (Tokyo), McGraw-Hill MIX (Minneapolis), and PLATO computer communications.

In September 1987, he began a one-year project working on development of the educational telecommunications plan for the Hawaii State Department of Education.





Section V:
Summary

Session Notes

During the Education Advisory Council conference, participants had the chance to exchange ideas and concerns about the present and future of telecommunications in education. Council members concurred that telecommunications could augment education in many arenas, but that there are obstacles to overcome before its widespread use will be accepted. The following article by Larry Vaughan is a synopsis of the issues raised during the breakout sessions at the conference.